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(11) **EP 1 329 985 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
22.12.2004 Bulletin 2004/52

(51) Int Cl.7: **H01Q 1/24**, H01Q 9/04,
H01Q 1/48

(43) Date of publication A2:
23.07.2003 Bulletin 2003/30

(21) Application number: **03000641.5**

(22) Date of filing: **15.01.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT SE SI SK TR**
Designated Extension States:
AL LT LV MK RO

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(30) Priority: **18.01.2002 JP 2002010572**

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(54) **Antenna apparatus; communication apparatus; and antenna apparatus designing method**

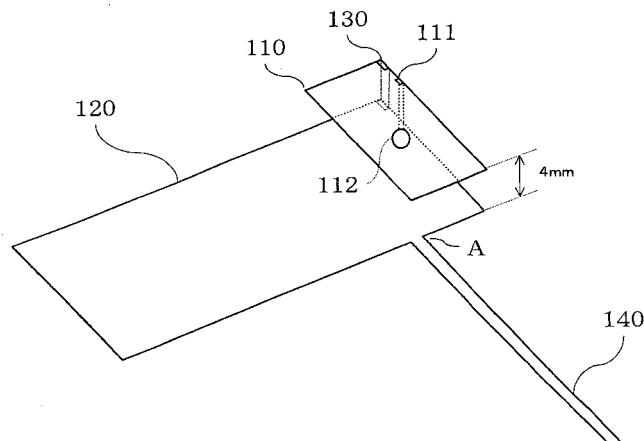
(57) (Object)

For a PDC (Personal Digital Cellular) folding cellular phone that uses, for example, an 800-MHz band for communication, it is desirable to reduce a height of an antenna apparatus in order to reduce a thickness of the cellular phone.

(Constitution)

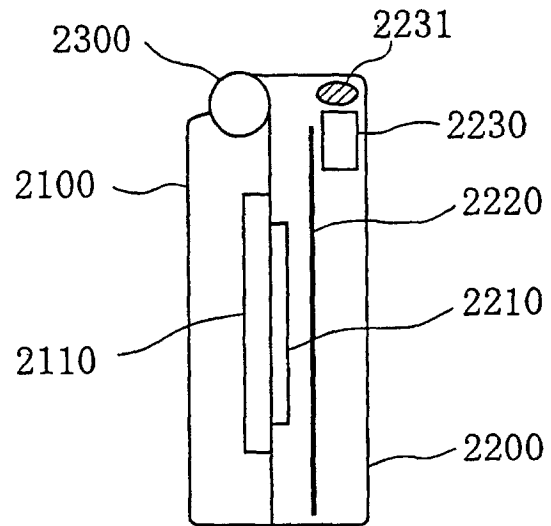
An antenna apparatus including an antenna element having a feeding plate, a ground plate arranged opposite the antenna element, a short circuit section that connects the antenna element and the ground plate together, and one or more ground wires each connected to the ground plate at a predetermined position and each having a (1) linear shape or a (2) bent or curved shape.

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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 0641

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	WO 99/54956 A (ALLGON AB ;KURZ HANS PETER (SE); JOHNSON HOWARD WILLIAM (US)) 28 October 1999 (1999-10-28) * the whole document *	1,4-10, 12-18, 21,22	H01Q1/24 H01Q9/04 H01Q1/48
A	EP 1 168 491 A (ERICSSON TELEFON AB L M) 2 January 2002 (2002-01-02) * paragraph '0015! - paragraph '0016!; figure 2 *	1	
X	US 5 945 954 A (JOHNSON GREG F) 31 August 1999 (1999-08-31) * column 3, line 28 - column 4, line 25; figures 1,2 *	19	
			TECHNICAL FIELDS SEARCHED (Int.CI.7)
			H01Q
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 October 2004	Examiner La Casta Muñoa, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.02 (P04/C01)



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
1-10, 12-22
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 03 00 0641

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-10,12-18,21,22

Planar inverted F-antenna with ground wires connected to ground plane

2. claim: 11

Planar inverted F-antenna with plurality of short-circuit pins and switch circuits for switching to one of the plurality of short circuit pins

3. claims: 19,20

Communication apparatus comprising an antenna and a substrate within a first enclosure, the first enclosure being joined by a hinge with a second enclosure, a ground of the substrate being electrically connected with the hinge

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 00 0641

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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06-10-2004

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82